

## CONTENTS

|  |            |
|--|------------|
| SUMMARY .....  | S-1        |
| S.1    Introduction and Background .....   | S-1        |
| S.2    Studies Leading to the Program EIR/EIS.....                                   | S-2        |
| S.3    Purpose of and Need for a High-Speed Train System in California.....          | S-2        |
| S.4    Alternatives, Including High-Speed Train .....                                | S-3        |
| S.4.1    No Project Alternative .....  | S-3        |
| S.4.2    Modal Alternative.....  | S-3        |
| S.4.3    High-Speed Train Alternative .....  | S-4        |
| S.4.4    Areas of Controversy.....   | S-5        |
| S.5    Key Findings .....  | S-6        |
| S.5.1    No Project Alternative .....  | S-6        |
| S.5.2    Modal Alternative.....  | S-7        |
| S.5.3    High-Speed Train Alternative .....  | S-8        |
| S.5.4    Preferred System Alternative .....  | S-8        |
| S.6    System-wide Environmental Impact Comparison .....                             | S-9        |
| S.7    High-Speed Train Alignment and Station Options .....                          | S-17       |
| S.8    Least Environmentally Damaging Preferred Alternative (LEDPA) .....            | S-18       |
| S.9    Public and Agency Involvement .....   | S-18       |
| S.10   Next Steps in the Environmental Process .....                                 | S-18       |
| <b>1 PURPOSE AND NEED AND OBJECTIVES .....</b>                                       | <b>1-1</b> |
| 1.1    Introduction.....   | 1-1        |
| 1.2    Purpose of and Need for Improved Intercity Transportation in California ..... | 1-3        |
| 1.2.1    Purpose of High-Speed Train System.....                                     | 1-3        |
| 1.2.2    Need for High-Speed Train System.....                                       | 1-4        |
| <b>2 ALTERNATIVES.....</b>   | <b>2-1</b> |
| 2.1    Summary of System Alternatives .....  | 2-1        |
| 2.1.1    No Project Alternative .....  | 2-1        |
| 2.1.1    Modal Alternative.....  | 2-1        |
| 2.1.2    High-Speed Train Alternative .....  | 2-1        |
| 2.2    Chapter Organization .....  | 2-2        |
| 2.3    Development of Alternatives.....  | 2-2        |
| 2.3.1    Background.....   | 2-2        |
| 2.3.2    Formulation of Alternatives.....  | 2-4        |
| 2.4    No Project Alternative .....  | 2-11       |
| 2.4.1    Highway Element.....  | 2-11       |
| 2.4.2    Aviation Element .....  | 2-12       |
| 2.4.3    Conventional Passenger Rail Element .....                                   | 2-14       |
| 2.5    Modal Alternative .....   | 2-15       |
| 2.5.1    Modal Alternatives Considered and Rejected .....                            | 2-16       |
| 2.5.2    Modal Alternative Carried Forward .....                                     | 2-17       |
| 2.6    High-Speed Train Alternative .....  | 2-23       |
| 2.6.1    Travel Times and Frequency of Service.....                                  | 2-23       |
| 2.6.2    Conceptual Service Plan .....   | 2-24       |
| 2.6.3    Potential for Freight Service.....  | 2-25       |
| 2.6.4    Performance Criteria .....  | 2-26       |
| 2.6.5    Description of High-Speed Train Technology Groups .....                     | 2-26       |
| 2.6.6    High-Speed Train Technology Options Considered and Rejected .....           | 2-27       |
| 2.6.7    High-Speed Train Technology Options Carried Forward .....                   | 2-29       |

|        |   |              |
|--------|---|--------------|
| 2.6.8  | Previously Considered Alternative Corridor Options Reconsidered and Rejected .....      | 2-30         |
| 2.6.9  | Alternative Alignment and Station Options Considered in Screening Evaluation.....       | 2-41         |
| 2.6.10 | Maintenance and Storage Facilities.....   | 2-94         |
| 2.7    | Alternatives Summary.....   | 2-96         |
| 2.7.1  | No Project Alternative .....  | 2-96         |
| 2.7.2  | Modal Alternative.....  | 2-96         |
| 2.7.3  | High-Speed Train Alternative .....  | 2-98         |
| 3      | <b>AFFECTED ENVIRONMENT, ENVIRONMENTAL CONSEQUENCES, AND MITIGATION STRATEGIES.....</b> | <b>3.0-1</b> |
| 3.0    | Introduction.....   | 3.0-1        |
| 3.0.1  | Purpose and Content of this Chapter .....   | 3.0-1        |
| 3.0.2  | How this Chapter is Organized .....   | 3.0-1        |
| 3.1    | Traffic and Circulation.....  | 3.1-1        |
| 3.1.1  | Regulatory Requirements and Methods of Evaluation .....                                 | 3.1-1        |
| 3.1.2  | Affected Environment.....   | 3.1-4        |
| 3.1.3  | Environmental Consequences .....  | 3.1-7        |
| 3.1.4  | Comparison of Alternatives by Region.....   | 3.1-14       |
| 3.1.5  | Mitigation Strategies .....   | 3.1-23       |
| 3.1.6  | Subsequent Analysis .....   | 3.1-24       |
| 3.2    | Travel Conditions .....   | 3.2-1        |
| 3.2.1  | Methods of Evaluation.....  | 3.2-1        |
| 3.2.2  | Affected Environment.....   | 3.2-4        |
| 3.2.3  | Environmental Consequences .....  | 3.2-6        |
| 3.2.4  | High-Speed Train Alignment Options Comparison .....                                     | 3.2-38       |
| 3.3    | Air Quality .....   | 3.3-1        |
| 3.3.1  | Regulatory Requirements and Methods of Evaluation .....                                 | 3.3-1        |
| 3.3.2  | Affected Environment.....   | 3.3-8        |
| 3.3.3  | Environmental Consequences .....  | 3.3-15       |
| 3.3.4  | Mitigation Strategies .....   | 3.3-33       |
| 3.3.5  | Subsequent Analysis .....   | 3.3-33       |
| 3.4    | Noise and Vibration .....   | 3.4-1        |
| 3.4.1  | Regulatory Requirements and Methods of Evaluation .....                                 | 3.4-1        |
| 3.4.2  | Affected Environment.....   | 3.4-7        |
| 3.4.3  | Environmental Consequences .....  | 3.4-14       |
| 3.4.4  | Comparison of Alternatives by Region.....   | 3.4-16       |
| 3.4.5  | Mitigation Strategies .....   | 3.4-23       |
| 3.4.6  | Subsequent Analysis .....   | 3.4-25       |
| 3.5    | Energy .....  | 3.5-1        |
| 3.5.1  | Regulatory Requirements and Methods of Evaluation .....                                 | 3.5-1        |
| 3.5.2  | Affected Environment.....   | 3.5-6        |
| 3.5.3  | Environmental Consequences .....  | 3.5-12       |
| 3.5.4  | Comparison of Alternatives by Region.....   | 3.5-14       |
| 3.5.5  | Mitigation Strategies .....   | 3.5-22       |
| 3.5.6  | Subsequent Analysis .....   | 3.5-23       |
| 3.6    | Electromagnetic Fields and Electromagnetic Interference .....                           | 3.6-1        |
| 3.6.1  | Regulatory Requirements and Methods of Evaluation .....                                 | 3.6-1        |
| 3.6.2  | Affected Environment.....   | 3.6-2        |
| 3.6.3  | Environmental Consequences .....  | 3.6-3        |
| 3.6.4  | Mitigation Strategies .....   | 3.6-5        |
| 3.6.5  | Subsequent Analysis .....   | 3.6-5        |

|        |   |         |
|--------|---|---------|
| 3.7    | Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice ..... | 3.7-1   |
| 3.7.1  | Regulatory Requirements and Methods of Evaluation .....   | 3.7-1   |
| 3.7.2  | Affected Environment.....   | 3.7-5   |
| 3.7.3  | Environmental Consequences .....  | 3.7-11  |
| 3.7.4  | Comparison of Alternatives by Region.....   | 3.7-13  |
| 3.7.5  | Mitigation Strategies .....   | 3.7-26  |
| 3.7.6  | Subsequent Analysis .....   | 3.7-27  |
| 3.8    | Agricultural Lands.....   | 3.8-1   |
| 3.8.1  | Regulatory Requirements and Methods of Evaluation .....   | 3.8-1   |
| 3.8.2  | Affected Environment.....   | 3.8-5   |
| 3.8.3  | Environmental Consequences .....  | 3.8-8   |
| 3.8.4  | Comparison of Alternatives by Region.....   | 3.8-11  |
| 3.8.5  | Mitigation Strategies .....   | 3.8-18  |
| 3.8.6  | Subsequent Analysis .....   | 3.8-18  |
| 3.9    | Aesthetics and Visual Resources .....   | 3.9-1   |
| 3.9.1  | Regulatory Requirements and Methods of Evaluation .....   | 3.9-1   |
| 3.9.2  | Affected Environment.....   | 3.9-2   |
| 3.9.3  | Environmental Consequences .....  | 3.9-9   |
| 3.9.4  | Comparison of Alternatives by Region.....   | 3.9-11  |
| 3.9.5  | Photo Simulations of Alternatives in Selected Scenic Areas .....                                | 3.9-19  |
| 3.9.6  | Mitigation Strategies .....   | 3.9-20  |
| 3.9.7  | Subsequent Analysis .....   | 3.9-21  |
| 3.10   | Public Utilities .....  | 3.10-1  |
| 3.10.1 | Regulatory Requirements and Methods of Evaluation .....   | 3.10-1  |
| 3.10.2 | Affected Environment.....   | 3.10-3  |
| 3.10.3 | Environmental Consequences .....  | 3.10-5  |
| 3.10.4 | Comparison of Alternatives by Region.....   | 3.10-7  |
| 3.10.5 | Mitigation Strategies .....   | 3.10-11 |
| 3.10.6 | Subsequent Analysis .....   | 3.10-11 |
| 3.11   | Hazardous Materials and Wastes.....   | 3.11-1  |
| 3.11.1 | Regulatory Requirements and Methods of Evaluation .....   | 3.11-1  |
| 3.11.2 | Affected Environment.....   | 3.11-3  |
| 3.11.3 | Environmental Consequences and Comparison of Alternatives by Region.....                        | 3.11-3  |
| 3.11.4 | Mitigation Strategies .....   | 3.11-5  |
| 3.11.5 | Subsequent Analysis .....   | 3.11-5  |
| 3.12   | Cultural and Paleontological Resources.....   | 3.12-1  |
| 3.12.1 | Regulatory Requirements and Methods of Evaluation .....   | 3.12-1  |
| 3.12.2 | Affected Environment.....   | 3.12-6  |
| 3.12.3 | Environmental Consequences .....  | 3.12-17 |
| 3.12.4 | Comparison of Alternatives by Region.....   | 3.12-19 |
| 3.12.5 | Mitigation Strategies .....   | 3.12-25 |
| 3.12.6 | Subsequent Analysis .....   | 3.12-27 |
| 3.13   | Geology and Soils.....  | 3.13-1  |
| 3.13.1 | Regulatory Requirements and Methods of Evaluation .....   | 3.13-1  |
| 3.13.2 | Affected Environment.....   | 3.13-4  |
| 3.13.3 | Environmental Consequences .....  | 3.13-7  |
| 3.13.4 | Comparison of Alternatives by Region.....   | 3.13-10 |
| 3.13.5 | Mitigation Strategies .....   | 3.13-13 |
| 3.13.6 | Subsequent Analysis .....   | 3.13-14 |
| 3.14   | Hydrology and Water Resources .....   | 3.14-1  |
| 3.14.1 | Regulatory Requirements and Methods of Evaluation.....  | 3.14-1  |

|        |  |         |
|--------|--|---------|
| 3.14.2 | Affected Environment.....  | 3.14-3  |
| 3.14.3 | Environmental Consequences .....   | 3.14-8  |
| 3.14.4 | Comparison of Alternatives by Region.....  | 3.14-12 |
| 3.14.5 | Mitigation Strategies .....  | 3.14-18 |
| 3.14.6 | Subsequent Analysis .....  | 3.14-19 |
| 3.15   | Biological Resources and Wetlands .....  | 3.15-1  |
| 3.15.1 | Regulatory Requirements and Methods of Evaluation.....   | 3.15-1  |
| 3.15.2 | Affected Environment.....  | 3.15-3  |
| 3.15.3 | Environmental Consequences .....   | 3.15-17 |
| 3.15.4 | Comparison of Alternatives by Region.....  | 3.15-20 |
| 3.15.5 | Mitigation Strategies .....  | 3.15-30 |
| 3.15.6 | Subsequent Analysis .....  | 3.15-31 |
| 3.16   | Section 4(f) and 6(f) Resources (Public Parks and Recreation).....   | 3.16-1  |
| 3.16.1 | Regulatory Requirements and Methods of Evaluation.....   | 3.16-1  |
| 3.16.2 | Affected Environment.....  | 3.16-3  |
| 3.16.3 | Environmental Consequences .....   | 3.16-4  |
| 3.16.4 | Comparison of Alternatives by Region.....  | 3.16-6  |
| 3.16.5 | Impact Avoidance Strategies, Including Alternatives Screened from Further Consideration .....                          | 3.16-10 |
| 3.16.6 | Avoidance Alternatives or Reasons for No Prudent or Feasible Alternative for Use of Section 4(f) or 6(f) Resource..... | 3.16-11 |
| 3.16.7 | Mitigation Strategies .....  | 3.16-11 |
| 3.16.8 | Subsequent Analysis .....  | 3.16-12 |
| 3.17   | Cumulative Impacts Evaluation .....  | 3.17-1  |
| 3.17.1 | Introduction to Cumulative Impacts .....   | 3.17-1  |
| 3.17.2 | Cumulative Impacts Analysis.....   | 3.17-2  |
| 4      | COSTS AND OPERATIONS.....  | 4-1     |
| 4.1    | Introduction.....  | 4-1     |
| 4.2    | Capital Costs.....   | 4-1     |
| 4.2.1  | Modal Alternative.....   | 4-1     |
| 4.2.2  | High-Speed Train Alternative .....   | 4-3     |
| 4.3    | Operations and Maintenance Costs .....   | 4-4     |
| 4.3.1  | Modal Alternative.....   | 4-4     |
| 4.3.2  | High-Speed Train Alternative .....   | 4-5     |
| 4.3.3  | Operating Cost Comparison of the Alternatives.....   | 4-7     |
| 5      | ECONOMIC GROWTH AND RELATED IMPACTS .....  | 5-1     |
| 5.1    | Introduction.....  | 5-1     |
| 5.2    | Affected Environment .....   | 5-1     |
| 5.2.1  | Existing Conditions .....  | 5-1     |
| 5.2.2  | Study Area and Alternatives.....   | 5-3     |
| 5.2.3  | Analysis Years .....   | 5-5     |
| 5.3    | Potential Growth-Inducing Effects .....  | 5-5     |
| 5.3.1  | Methodology and Data Sources.....  | 5-5     |
| 5.3.2  | Financing of Alternatives .....  | 5-8     |
| 5.3.3  | Statewide Comparison of Alternatives .....   | 5-9     |
| 5.3.4  | Regional and County Effects .....  | 5-13    |
| 5.3.5  | HST Alignment Options .....  | 5-21    |
| 5.3.6  | Summary of Effects .....   | 5-21    |
| 5.4    | Potential Indirect Impacts of Induced Growth .....   | 5-23    |
| 5.4.1  | Transportation.....  | 5-23    |
| 5.4.2  | Air Quality.....   | 5-24    |
| 5.4.3  | Noise and Vibration.....   | 5-24    |
| 5.4.4  | Energy.....  | 5-24    |

|        |   |      |
|--------|---|------|
| 5.4.5  | Electromagnetic Frequency and Electromagnetic Interference.....   | 5-25 |
| 5.4.6  | Land Use, Communities and Neighborhoods, Property, and Environmental Justice .....  | 5-25 |
| 5.4.7  | Farmland and Agriculture .....  | 5-27 |
| 5.4.8  | Aesthetics and Visual Resources.....  | 5-29 |
| 5.4.9  | Utilities and Public Services.....  | 5-29 |
| 5.4.10 | Hazardous Materials and Wastes .....  | 5-29 |
| 5.4.11 | Cultural and Paleontological Resources .....  | 5-30 |
| 5.4.12 | Geology and Soils .....   | 5-30 |
| 5.4.13 | Hydrology and Water Resources .....   | 5-30 |
| 5.4.14 | Biological Resources .....  | 5-31 |
| 5.4.15 | Wetlands .....  | 5-32 |
| 5.4.16 | Section 4(f) and 6(f) Resources (Public Parks and Recreation).....  | 5-33 |
| 5.5    | Managing Growth-Inducing and Indirect Effects .....   | 5-33 |
| 5.5.1  | Avoidance and Minimization Strategies .....   | 5-33 |
| 5.5.2  | Sensitivity of Results to Base Population and Employment Forecasts .....  | 5-34 |
| 5.5.3  | Sensitivity of Results to Project Cost and Funding Assumptions.....   | 5-36 |
| 6      | <b>HIGH-SPEED TRAIN ALIGNMENT OPTIONS COMPARISON.....</b>   | 6-1  |
| 6.1    | Introduction.....   | 6-1  |
| 6.1.1  | Purpose and Content of this Chapter .....   | 6-1  |
| 6.1.2  | Organization of this Chapter .....  | 6-1  |
| 6.2    | Bay Area to Merced Region .....   | 6-3  |
| 6.2.1  | Bay Area to Merced Alignment Options .....  | 6-3  |
| 6.2.2  | Bay Area to Merced Station Options .....  | 6-17 |
| 6.3    | Sacramento to Bakersfield Region.....   | 6-21 |
| 6.3.1  | Sacramento to Bakersfield Alignment Options .....   | 6-21 |
| 6.3.2  | Sacramento to Bakersfield Station Options.....  | 6-40 |
| 6.4    | Bakersfield to Los Angeles Region.....  | 6-47 |
| 6.4.1  | Bakersfield to Sylmar Alignment Options.....  | 6-47 |
| 6.4.2  | Sylmar to Los Angeles Alignment Options .....   | 6-54 |
| 6.4.3  | Bakersfield to Los Angeles Station Options .....  | 6-57 |
| 6.5    | Los Angeles to San Diego via Inland Empire .....  | 6-60 |
| 6.5.1  | Los Angeles to March Air Reserve Base Alignment Options .....   | 6-60 |
| 6.5.2  | March Air Reserve Base to Mira Mesa Alignment Options .....   | 6-66 |
| 6.5.3  | Mira Mesa to San Diego Alignment Options .....  | 6-69 |
| 6.5.4  | Los Angeles to San Diego Station Options .....  | 6-74 |
| 6.6    | Los Angeles to San Diego via Orange County .....  | 6-79 |
| 6.6.1  | Los Angeles to Los Angeles International Airport Alignment Options .....  | 6-79 |
| 6.6.2  | Los Angeles Union Station to Orange County Alignment Options .....  | 6-81 |
| 6.6.3  | Orange County to Oceanside Alignment Options .....  | 6-87 |
| 6.6.4  | Oceanside to San Diego Alignment Options .....  | 6-91 |
| 6.6.5  | Los Angeles to San Diego Station Options .....  | 6-98 |
| 7      | <b>UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS .....</b>  | 7-1  |
| 7.1    | Unavoidable Potentially Significant Impacts .....   | 7-1  |
| 7.1.1  | Fuel Consumption and Energy Use .....   | 7-1  |
| 7.1.2  | Biological Resources and Wetlands, Agricultural Land, Section 4(f) and 6(f) Resources, Cultural and Paleontological Resources, and Visual Resources ..... | 7-1  |
| 7.1.3  | Construction Impacts .....  | 7-2  |
| 7.2    | Relationship Between Short-Term Uses of Environment and Enhancement of Long-Term Productivity.....  | 7-2  |
| 7.3    | California Environmental Quality Act Significance.....  | 7-3  |
| 7.3.1  | California Environmental Quality Act Significance Thresholds .....  | 7-3  |

|       |  |       |
|-------|--|-------|
| 7.3.2 | Significant Unavoidable Adverse Effects .....  | 7-4   |
| 7.3.3 | California Environmental Quality Act Environmentally Superior Alternative .....                            | 7-5   |
| 8     | PUBLIC AND AGENCY INVOLVEMENT .....  | 8-1   |
| 8.1   | Public Involvement and Outreach .....  | 8-1   |
| 8.1.1 | Public Information .....   | 8-1   |
| 8.1.2 | Public Meetings .....  | 8-2   |
| 8.2   | Agency Consultation .....  | 8-5   |
| 8.2.1 | Agency Scoping .....   | 8-5   |
| 8.2.2 | Interagency Consultation.....  | 8-5   |
| 8.2.3 | Other Agency Consultation .....  | 8-5   |
| 8.3   | Scoping Summary .....  | 8-5   |
| 8.3.1 | Bay Area to Merced .....   | 8-6   |
| 8.3.2 | Sacramento to Bakersfield .....  | 8-6   |
| 8.3.3 | Bakersfield to Los Angeles .....   | 8-6   |
| 8.3.4 | Los Angeles to San Diego via Inland Empire.....  | 8-6   |
| 8.3.5 | Los Angeles to San Diego via Orange County .....   | 8-6   |
| 8.4   | Notification and Circulation of the Draft Program EIR/EIS .....  | 8-7   |
| 9     | ORGANIZATION, AGENCY, AND BUSINESS OUTREACH .....  | 9-1   |
| 10    | LIST OF PREPARERS .....  | 10-1  |
|       | California High Speed Rail Authority .....   | 10-1  |
|       | Federal Railroad Administration .....  | 10-1  |
|       | List of Consultants.....   | 10-1  |
| 11    | DRAFT PROGRAM EIR/EIS DISTRIBUTION .....   | 11-1  |
| 11.1  | Repository Locations.....  | 11-1  |
| 11.2  | Federal Agencies .....   | 11-4  |
| 11.3  | State Agencies .....   | 11-4  |
| 11.4  | Elected Officials.....   | 11-5  |
|       | Federal Elected Officials .....  | 11-5  |
|       | State Elected Officials .....  | 11-6  |
| 11.5  | Regional/Local Agencies by Corridor Segment.....   | 11-11 |
|       | Region 1—Sacramento to Bakersfield .....   | 11-11 |
|       | Region 2—Bay Area to Merced .....  | 11-11 |
|       | Region 3—Bakersfield to Los Angeles .....  | 11-11 |
|       | Region 4—Los Angeles to Orange County to San Diego .....   | 11-12 |
|       | Region 5—Los Angeles to Riverside to San Diego .....   | 11-12 |
| 11.6  | Organizations and Businesses.....  | 11-12 |
| 12    | SOURCES USED IN DOCUMENT PREPARATION.....  | 12-1  |
| 12.1  | Chapter 1 Purpose and Need and Objectives.....   | 12-1  |
| 12.2  | Chapter 2 Alternatives .....   | 12-1  |
| 12.3  | Section 3.1 Traffic and Circulation.....   | 12-3  |
| 12.4  | Section 3.2 Travel Conditions .....  | 12-9  |
| 12.5  | Section 3.3 Air Quality .....  | 12-10 |
| 12.6  | Section 3.4 Noise and Vibration .....  | 12-11 |
| 12.7  | Section 3.5 Energy .....   | 12-11 |
| 12.8  | Section 3.6 Electromagnetic Fields and Electromagnetic Interference .....                                  | 12-14 |
| 12.9  | Section 3.7 Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice..... | 12-16 |
| 12.10 | Section 3.8 Agricultural Lands .....   | 12-27 |
| 12.11 | Section 3.9 Aesthetics and Visual Resources .....  | 12-28 |
| 12.12 | Section 3.10 Public Utilities.....   | 12-28 |
| 12.13 | Section 3.11 Hazardous Materials and Wastes.....   | 12-30 |
| 12.14 | Section 3.12 Cultural and Paleontological Resources .....  | 12-30 |

|       |   |       |
|-------|---|-------|
| 12.15 | Section 3.13 Geology and Soils.....   | 12-31 |
| 12.16 | Section 3.14 Hydrology and Water Resources .....                                | 12-32 |
| 12.17 | Section 3.15 Biological Resources and Wetlands.....                             | 12-32 |
| 12.18 | Section 3.16 Section 4(f) and 6(f) Resources (Public Parks and Recreation)..... | 12-33 |
| 12.19 | Section 3.17 Cumulative Impacts Evaluation.....                                 | 12-36 |
| 12.20 | Chapter 4 Costs and Operations .....  | 12-36 |
| 12.21 | Chapter 5 Economic Growth and Related Impacts .....                             | 12-37 |
| 12.22 | Appendices .....  | 12-37 |
| 13    | GLOSSARY .....  | 13-1  |
|       | INDEX   |       |

## **APPENDICES (INCLUDED IN SEPARATE VOLUME)**

|        |   |
|--------|---|
| 2-A    | Detailed Description of Highway Element of No Project Alternative                                 |
| 2-B    | Detailed Description of Aviation Element of No Project Alternative                                |
| 2-C    | No Project Alternative Projects Funded for Intercity and Freight Rail in the State of California  |
| 2-D    | Detailed Description of the Highway-Only System Improvements                                      |
| 2-E    | Detailed Description of the Aviation-Only System Improvements                                     |
| 2-F    | Detailed Description of the Highway Improvement Option Methodology                                |
| 2-G    | Description of the Modal Alternative Aviation Improvement Option Methodology                      |
| 2-H    | HST Alignment and Station Screening Evaluation Summary Tables                                     |
| 2-I    | Screening Evaluation Methodology and Criteria   |
| 2-J    | Cost Estimate for San Francisco Bay Crossing  |
| 3.1-A  | Traffic Data  |
| 3.1-B  | Arterials Proposed for Grade Separations in the Los Angeles to San Diego via Orange County Region |
| 3.2-A  | Line-Haul Travel Times for Air and High-Speed Train   |
| 3.2-B  | Description of Travel Time Components   |
| 3.4-A  | Noise and Vibration Screening Distances   |
| 3.4-B  | Noise and Vibration Rating Method   |
| 3.4-C  | Noise and Vibration Impact Criteria   |
| 3.4-D  | Noise Impact Results  |
| 3.4-E  | Vibration Impact Results  |
| 3.4-F  | Noise Typology Locations  |
| 3.8-A  | Potential HST Alternative Impacts on Agricultural Lands   |
| 3.10-A | Regional Utility Providers  |
| 3.10-B | Summary of Potential Public Utilities Conflicts   |
| 3.11-A | Results of Hazardous Materials Database Searches  |
| 3.12-A | Letter to State Historic Preservation Office  |
| 3.13-A | Geology Summary Tables by Region  |
| 3.14-A | Detailed Description of Hydrology Regulatory Requirements   |
| 3.14-B | Summary of Potential Hydrological Resource and Water Quality Conflicts by Alternative             |
| 3.15-A | General Description of Biological Resource Topics   |
| 3.15-B | Detailed Description of Biology and Wetlands Regulatory Requirements                              |
| 3.15-C | Data Collection for Natural Resources   |
| 3.15-D | Summary of Potential Impacts on Biological Resources and Wetlands                                 |
| 3.16-A | Section 4(f) and 6(f) Regional Summary Tables   |
| 3.17-A | List of Projects for Cumulative Analysis  |
| 4-A    | Capital Cost: Highway Component of Modal Alternative  |
| 4-B    | Capital Cost: Aviation Component of Modal Alternative   |

- 4-C Capital Cost: High-speed train alternative  
 4-D California High Speed Rail: PCC—Life Cycle Analysis (Modal Alternative Additional Lane Miles)  
 4-E Operating and Maintenance Costs for Air Component of the Modal Alternative

## FIGURES

|        | Follows Page   |              |
|--------|--|--------------|
| S.4-1  | California Transportation System .....                                       | S-4          |
| S.4-2  | High-Speed Train Corridors and Stations for Continued Investigation.....     | S-4          |
| 1.2-1  | California Population (millions) .....                                       | on page 1-5  |
| 1.2-2  | Regional Population Growth 2000-2040 (millions) .....                        | on page 1-5  |
| 1.2-3  | Major Intercity Travel Routes and Airports.....                              | on page 1-7  |
| 1.2-4  | Airport Delay—1999a.....   | 1-10         |
| 1.2-5  | 2001 Area Designations for National Ambient Air Quality Standards—Ozone..... | on page 1-11 |
| 2.1-1  | Study Regions.....   | 2-2          |
| 2.3-1  | Relationship between Previous California High-Speed Train Studies .....      | 2-4          |
| 2.3-2  | Initial Phase Corridors (Commission Studies, 1996) .....                     | 2-4          |
| 2.3-3  | Corridors for Continued Consideration (Commission Studies, 1996) .....       | 2-4          |
| 2.4-1  | California Transportation System .....                                       | 2-12         |
| 2.5-1  | Highway Improvement Component of Modal Alternative .....                     | 2-18         |
| 2.5-2  | Typical Highway Improvement Cross-Sections .....                             | 2-18         |
| 2.5-3  | Aviation Improvement Component of Modal Alternative.....                     | 2-22         |
| 2.6-1  | Average Operating Speed on High-Speed Train System .....                     | 2-24         |
| 2.6-2  | VHS and Maglev Technology Examples .....                                     | 2-26         |
| 2.6-3  | At-Grade Section.....  | 2-30         |
| 2.6-4  | Elevated Structure.....  | 2-30         |
| 2.6-5  | Twin Tunnels.....  | 2-30         |
| 2.6-6  | Major Corridor Alternatives (Los Angeles to San Francisco Bay Area) .....    | 2-32         |
| 2.6-7  | Capitol Corridor.....  | 2-34         |
| 2.6-8  | Northern Mountain Passes .....   | 2-36         |
| 2.6-9  | Altamont Pass Alignment Option.....  | 2-36         |
| 2.6-10 | Service Branching on Alignment Options .....                                 | 2-36         |
| 2.6-11 | Union Station Terminus Versus LAX .....                                      | 2-38         |
| 2.6-12 | East Mission Valley and Penasquitos Canyon.....                              | 2-40         |
| 2.6-13 | Initial Alignment and Station Options - Northern Portion .....               | 2-42         |
| 2.6-14 | Initial Alignment and Station Options - Southern Portion.....                | 2-42         |
| 2.6-15 | Eliminated Alignments and Stations Bay Area to Merced .....                  | 2-44         |
| 2.6-16 | Eliminated Alignments San Francisco to San Jose.....                         | 2-46         |
| 2.6-17 | Eliminated Alignments Oakland to San Jose.....                               | 2-48         |
| 2.6-18 | Eliminated Alignments San Jose to Merced .....                               | 2-50         |
| 2.6-19 | Bay Area to Merced Corridor Alignments and Stations Carried Forward .....    | 2-52         |
| 2.6-20 | San Francisco to San Jose Alignments Carried Forward.....                    | 2-52         |

|        |   |      |
|--------|---|------|
| 2.6-21 | Oakland to San Jose Alignments Carried Forward.....   | 2-52 |
| 2.6-22 | San Jose to Merced Alignments Carried Forward.....  | 2-54 |
| 2.6-23 | Eliminated Alignments and Stations Sacramento to Bakersfield (North) .....                          | 2-56 |
| 2.6-24 | Eliminated Alignments and Stations Sacramento to Bakersfield (South).....                           | 2-56 |
| 2.6-25 | Eliminated Alignments Sacramento to Stockton.....   | 2-58 |
| 2.6-26 | Eliminated Alignments Stockton to Modesto.....  | 2-58 |
| 2.6-27 | Eliminated Alignments Merced to Fresno .....  | 2-60 |
| 2.6-28 | Eliminated Alignments Fresno.....   | 2-60 |
| 2.6-29 | Eliminated Alignments Fresno to Tulare.....   | 2-60 |
| 2.6-30 | Eliminated Alignments Tulare to Bakersfield.....  | 2-62 |
| 2.6-31 | Sacramento to Bakersfield Corridor (North) Alignments and Stations Carried Forward .....            | 2-62 |
| 2.6-32 | Sacramento to Bakersfield Corridor (South) Alignments and Stations Carried Forward .....            | 2-62 |
| 2.6-33 | Sacramento to Stockton Alignments and Stations Carried Forward.....                                 | 2-62 |
| 2.6-34 | Sacramento to Stockton Alignments and Stations Carried Forward .....                                | 2-62 |
| 2.6-35 | Stockton to Modesto Alignments and Stations Carried Forward.....                                    | 2-62 |
| 2.6-36 | Modesto to Merced Alignments and Stations Carried Forward.....                                      | 2-64 |
| 2.6-37 | Merced to Fresno Alignments and Stations Carried Forward .....                                      | 2-64 |
| 2.6-38 | Fresno to Tulare Alignments and Stations Carried Forward.....                                       | 2-64 |
| 2.6-39 | Tulare to Bakersfield Alignments and Stations Carried Forward .....                                 | 2-66 |
| 2.6-40 | Eliminated Alignments and Stations Bakersfield to Los Angeles.....                                  | 2-68 |
| 2.6-41 | Eliminated Alignments Bakersfield to Sylmar.....  | 2-70 |
| 2.6-42 | Eliminated Alignments Sylmar to Los Angeles .....   | 2-72 |
| 2.6-43 | Eliminated Alignments Sylmar to Los Angeles .....   | 2-72 |
| 2.6-44 | Bakersfield to Los Angeles Corridor Alignments and Stations Carried Forward.....                    | 2-72 |
| 2.6-45 | Bakersfield to Sylmar Alignments and Stations Carried Forward .....                                 | 2-72 |
| 2.6-46 | Sylmar to Los Angeles Alignments and Stations Carried Forward .....                                 | 2-74 |
| 2.6-47 | Sylmar to Los Angeles Alignments and Stations Carried Forward .....                                 | 2-74 |
| 2.6-48 | Eliminated Alignments and Stations Los Angeles to San Diego<br>(via Inland Empire) Corridor.....    | 2-76 |
| 2.6-49 | Eliminated Alignments Los Angeles to March Air Reserve Base .....                                   | 2-76 |
| 2.6-50 | Eliminated Alignments March Air Reserve Base to Mira Mesa.....                                      | 2-78 |
| 2.6-51 | Eliminated Alignments Mira Mesa to San Diego .....  | 2-78 |
| 2.6-52 | Los Angeles to San Diego (via Inland Empire) Corridor Alignments and Stations Carried Forward ..... | 2-80 |
| 2.6-53 | Los Angeles to March Air Reserve Base Alignments and Stations Carried Forward .....                 | 2-80 |
| 2.6-54 | March Air Reserve Base to Mira Mesa Alignments and Stations Carried Forward .....                   | 2-82 |
| 2.6-55 | Mira Mesa to San Diego Alignments and Stations Carried Forward .....                                | 2-82 |
| 2.6-56 | Eliminated Alignments and Stations Los Angeles to San Diego (Via Orange County) .....               | 2-84 |
| 2.6-57 | Eliminated Alignments LA Union Station/Southeast LA County to LAX.....                              | 2-86 |
| 2.6-58 | Eliminated Alignments LA Union Station to Central Orange County (Anaheim) .....                     | 2-86 |
| 2.6-59 | Eliminated Alignments Central Orange County (Anaheim) to Oceanside.....                             | 2-88 |

|        |  |        |
|--------|--|--------|
| 2.6-60 | Eliminated Alignments Oceanside to San Diego .....   | 2-88   |
| 2.6-61 | Los Angeles to San Diego (via Orange County) Corridor Alignments and Stations Carried Forward .....                              | 2-90   |
| 2.6-62 | LA Union Station/Southeast LA County to LAX Alignments and Stations Carried Forward .....  | 2-90   |
| 2.6-63 | LA Union Station to Central Orange County (Anaheim) Alignments and Stations Carried Forward .....                                | 2-90   |
| 2.6-64 | Central Orange County (Anaheim) to Oceanside Alignments and Stations Carried Forward .....                                       | 2-92   |
| 2.6-65 | Oceanside to San Diego Alignments and Stations Carrie .....  | 2-92   |
| 2.6-66 | Support Facilities Considered (North) .....  | 2-96   |
| 2.6-67 | Support Facilities Considered (South).....   | 2-96   |
| 2.7-1  | Modal Alternative Highway Improvement Component.....   | 2-96   |
| 2.7-2  | Modal Alternative Aviation Improvement Component.....  | 2-96   |
| 2.7-3  | High-Speed Train Corridors and Stations for Continued Investigation.....   | 2-98   |
| 2.7-4  | HST Alignment Options - Relation to Existing Transportation Corridors Bay Area to Merced Region .....                            | 2-100  |
| 2.7-5  | HST Alignment Options – Profile Characteristics Bay Area to Merced Region.....   | 2-100  |
| 2.7-6a | HST Alignment Options - Relation to Existing Transportation Corridors Sacramento to Bakersfield Region (North) .....             | 2-100  |
| 2.7-6b | HST Alignment Options - Relation to Existing Transportation Corridors Sacramento to Bakersfield Region (South).....              | 2-100  |
| 2.7-7a | HST Alignment Options – Profile Characteristics Sacramento to Bakersfield Region (North).....                                    | 2-100  |
| 2.7-7b | HST Alignment Options – Profile Characteristics Sacramento to Bakersfield Region (South) .....                                   | 2-100  |
| 2.7-8  | HST Alignment Options - Relation to Existing Transportation Corridors Bakersfield to Los Angeles Region .....                    | 2-100  |
| 2.7-9  | HST Alignment Options – Profile Characteristics Bakersfield to Los Angeles Region .....  | 2-100  |
| 2.7-10 | HST Alignment Options - Relation to Existing Transportation Corridors Los Angeles to San Diego via the Inland Empire Region..... | 2-100  |
| 2.7-11 | HST Alignment Options – Profile Characteristics Los Angeles to San Diego via the Inland Empire Region .....                      | 2-100  |
| 2.7-12 | HST Alignment Options - Relation to Existing Transportation Corridors Los Angeles to San Diego via Orange County Region.....     | 2-100  |
| 2.7-13 | HST Alignment Options – Profile Characteristics Los Angeles to San Diego via Orange County Region .....                          | 2-100  |
| 3.1-1  | No Project Alternative Average Change in V/C Ratios (Northern California).....   | 3.1-8  |
| 3.1-2  | No Project Alternative Average Change in V/C Ratios (Southern California) .....  | 3.1-8  |
| 3.1-3  | Modal Alternative Average Change in V/C Ratios (Northern California) .....   | 3.1-12 |
| 3.1-4  | Modal Alternative Average Change in V/C Ratios (Southern California).....  | 3.1-12 |
| 3.1-5  | HST Alternative Average Change in V/C Ratios (Northern California).....  | 3.1-12 |
| 3.1-6  | HST Alternative Average Change in V/C Ratios (Southern California) .....   | 3.1-12 |
| 3.2-1  | Nationwide Highway Congestion.....   | 3.2-4  |
| 3.2-2  | Bay Area Locations of Worst Congestion (as of 2001).....   | 3.2-6  |

|        |  |               |
|--------|--|---------------|
| 3.2-3  | Los Angeles Area Highway Congestion (2025 forecast) .....                                    | 3.2-8         |
| 3.3-1  | Air Basins Potentially Affected by Project Alternatives .....                                | 3.3-8         |
| 3.3-2  | Statewide Emissions (tons/day, annual average).....  | 3.3-16        |
| 3.3-3  | CO, PM10 NO <sub>x</sub> , TOG Source Distribution—Year 2020 .....                           | 3.3-16        |
| 3.4-1  | Typical Day-Night Sound Level Environments .....   | 3.4-8         |
| 3.4-2  | Maximum Operating Speeds (Northern California).....  | 3.4-10        |
| 3.4-3  | Maximum Operating Speeds (Southern California).....  | 3.4-10        |
| 3.4-4  | HST Source-Path-Receiver Framework .....   | 3.4-10        |
| 3.4-5  | Noise Sources on HST .....   | 3.4-10        |
| 3.4-6  | Vibration Propagation from HST .....   | 3.4-12        |
| 3.4-7  | Typical Lmax Values.....   | 3.4-12        |
| 3.4-8  | Example of Noise Exposure vs. Distance with Normalized Frequency.....                        | 3.4-12        |
| 3.4-9  | Example of Noise Exposure vs. Distance with Typical Frequencies .....                        | 3.4-12        |
| 3.4-10 | Potential Modal Alternative Noise Impact Levels-Northern California .....                    | 3.4-16        |
| 3.4-11 | Potential Modal Alternative Noise Impact Levels-Southern California .....                    | 3.4-16        |
| 3.4-12 | Potential HST Alternative Noise Impact Levels-Northern California .....                      | 3.4-16        |
| 3.4-13 | Potential HST Alternative Noise Impact Levels-Southern California.....                       | 3.4-16        |
| 3.4-14 | Mainline and Express Loop at Fresno .....  | 3.4-18        |
| 3.5-1  | Cal ISO-Controlled Grid.....   | 3.5-8         |
| 3.6-1  | Magnetic Field Levels for 14 Transportation Systems .....                                    | 3.6-4         |
| 3.7-1  | Existing Land Use Bay Area to Merced, and Sacramento .....                                   | 3.7-6         |
| 3.7-2  | Existing Land Use Merced to Bakersfield.....   | 3.7-6         |
| 3.7-3  | Existing Land Use Bakersfield to Los Angeles .....   | 3.7-6         |
| 3.7-4  | Existing Land Use Los Angeles to San Diego (via Inland Empire and Orange County).....        | 3.7-6         |
| 3.7-5  | Potential Property Impacts Bay Area to Merced Modal Alternative.....                         | 3.7-14        |
| 3.7-6  | Potential Property Impacts Bay Area to Merced HST Alternative .....                          | 3.7-14        |
| 3.7-7  | Potential Property Impacts Sacramento to Bakersfield (North) Modal Alternative.....          | 3.7-18        |
| 3.7-8  | Potential Property Impacts Sacramento to Bakersfield (South) Modal Alternative .....         | 3.7-18        |
| 3.7-9  | Potential Property Impacts Sacramento to Bakersfield (North) HST Alternative .....           | 3.7-18        |
| 3.7-10 | Potential Property Impacts Sacramento to Bakersfield (South) HST Alternative .....           | 3.7-18        |
| 3.7-11 | Potential Property Impacts Bakersfield to Los Angeles Modal Alternative .....                | 3.7-20        |
| 3.7-12 | Potential Property Impacts Bakersfield to Los Angeles HST Alternative.....                   | 3.7-20        |
| 3.7-13 | Potential Property Impacts Los Angeles to San Diego Via Inland Empire Modal Alternative..... | 3.7-22        |
| 3.7-14 | Potential Property Impacts Los Angeles to San Diego Via Inland Empire HST Alternative.....   | 3.7-22        |
| 3.7-15 | Potential Property Impacts Los Angeles to San Diego Via Orange County Modal Alternative..... | 3.7-26        |
| 3.7-16 | Potential Property Impacts Los Angeles to San Diego Via Orange County HST Alternative.....   | 3.7-26        |
| 3.8-1  | Modal Alternative Study Area (Highways) .....  | on page 3.8-4 |
| 3.8-2  | High-Speed Train Alternative Study Area (in Existing Railway Areas).....                     | on page 3.8-4 |

|         |   |               |
|---------|---|---------------|
| 3.8-3   | High-Speed Train Alternative Study Area .....   | on page 3.8-4 |
| 3.8-4A  | Modal Alternative North Portion of State.....   | 3.8-6         |
| 3.8-4B  | Modal Alternative South Portion of State .....  | 3.8-6         |
| 3.8-5A  | High-Speed Train Alternative North Portion of State .....   | 3.8-6         |
| 3.8-5B  | High-Speed Train Alternative South Portion of State.....  | 3.8-6         |
| 3.8-6   | Modal Alternative Improvement Locations Bay Area to Merced .....  | 3.8-12        |
| 3.8-7   | Alignments with Least Potential Impacts and Greatest Potential Impacts Bay Area to Merced.....                              | 3.8-12        |
| 3.8-8A  | Modal Alternative Improvement Locations Sacramento to Bakersfield, North Portion .....                                      | 3.8-14        |
| 3.8-8B  | Modal Alternative Improvement Locations Sacramento to Bakersfield, South Portion.....                                       | 3.8-14        |
| 3.8-9A  | Alignments with Least Potential Impacts and Greatest Potential Impacts Sacramento to Bakersfield North Portion .....        | 3.8-14        |
| 3.8-9B  | Alignments with Least Potential Impacts and Greatest Potential Impacts Sacramento to Bakersfield Region South Portion ..... | 3.8-14        |
| 3.8-10  | Modal Alternative Improvement Locations Bakersfield to Los Angeles .....  | 3.8-16        |
| 3.8-11  | Alignments with Least Potential Impacts and Greatest Potential Impacts Bakersfield to Los Angeles .....                     | 3.8-16        |
| 3.8-12  | Modal Alternative Improvement Locations Los Angeles to San Diego via Inland Empire .....                                    | 3.8-16        |
| 3.8-13  | Alignments with the Least Potential Impacts and Greatest Potential Impacts Los Angeles to San Diego via Inland Empire ..... | 3.8-16        |
| 3.8-14  | Modal Alternative Improvement Locations Los Angeles to San Diego via Orange County .....                                    | 3.8-18        |
| 3.8-15  | Alignment Options Los Angeles to San Diego via Orange County (LOSSAN) .....   | 3.8-18        |
| 3.9-1A  | Northern Region GIS Visually Sensitive Landscapes with Modal Alternative and HST Alignments .....                           | 3.9-4         |
| 3.9-1B  | Southern Region GIS Visually Sensitive Landscapes with Modal Alternative and HST Alignments .....                           | 3.9-4         |
| 3.9-2   | Gilroy Station.....   | 3.9-4         |
| 3.9-3   | Pacheco Pass.....   | 3.9-4         |
| 3.9-4   | Pixley .....  | 3.9-6         |
| 3.9-5   | Sacramento Power Inn .....  | 3.9-6         |
| 3.9-6   | Pyramid Lake.....   | 3.9-6         |
| 3.9-7   | Angeles National Forest .....   | 3.9-6         |
| 3.9-8   | Soledad Canyon .....  | 3.9-6         |
| 3.9-9   | Santa Clarita from Dockweiler Drive .....   | 3.9-8         |
| 3.9-10  | I-15 in San Diego .....   | 3.9-8         |
| 3.9-11  | Mission Bay .....   | 3.9-8         |
| 3.9-12  | San Clemente .....  | 3.9-8         |
| 3.9-13  | San Elijo Lagoon .....  | 3.9-10        |
| 3.9-14  | Photo simulation of Modal Alternative SR-152 (Pacheco Pass) with two added lanes .....                                      | 3.9-10        |
| 3.9-15  | Photo simulation HST Alternative SR-152 (Pacheco Pass).....   | 3.9-10        |
| 3.9-16A | Gilroy Station.....   | 3.9-20        |
| 3.9-16B | Photo Simulation of HST Alternative at Gilroy .....   | 3.9-10        |

|         |   |             |
|---------|---|-------------|
| 3.9-17A | Pixley .....  | 3.9-20      |
| 3.9-17B | Photo Simulation of HST Alternative at Pixley .....   | 3.9-20      |
| 3.9-18A | Soledad Canyon .....  | 3.9-20      |
| 3.9-18B | Photo simulation of HST Alternative at Soledad Canyon (Cut).....                              | 3.9-20      |
| 3.9-19A | I-15 Corridor in San Diego .....  | 3.9-20      |
| 3.9-19B | Photo Simulation of HST in I-15 Corridor in San Diego.....                                    | 3.9-20      |
| 3.9-19C | Photo Simulation of Highway Improvement (Modal) in I-15 Corridor in San Diego.....            | 3.9-20      |
| 3.9-20A | I-15 Corridor in La Jolla .....   | 3.9-20      |
| 3.9-20B | Photo simulation of HST Alternative I-15 Corridor in La Jolla .....                           | 3.9-20      |
| 3.9-21A | Little Italy, Downtown San Diego Water View .....   | 3.9-20      |
| 3.9-21B | Photo simulation of HST Alternative at Little Italy, Downtown San Diego Water View .....      | 3.9-20      |
| 3.9-22A | San Elijo Lagoon .....  | 3.9-20      |
| 3.9-22B | Photo simulation of HST Alternative at San Elijo Lagoon .....                                 | 3.9-20      |
| 3.10-1  | Major Utility Lines—Los Angeles to San Diego via Inland Empire Region.....                    | 3.10-4      |
| 3.11-1  | Hazardous Material and Waste Locations in the Study Area.....                                 | 3.11-4      |
| 3.13-1  | HST Design Options—Major Fault Crossings—San Francisco Bay Area .....                         | 3.13-10     |
| 3.13-2  | HST Design Options—Major Fault Crossings Tehachapi Mountains—Bakersfield to Los Angeles ..... | 3.13-12     |
| 3.14-1  | Floodplains Statewide (North) .....   | 3.14-4      |
| 3.14-2  | Floodplains Statewide (South) .....   | 3.14-4      |
| 3.14-3  | Surface Waters Statewide (North) .....  | 3.14-4      |
| 3.14-4  | Surface Waters Statewide (South) .....  | 3.14-4      |
| 3.14-5  | Groundwater Statewide (North).....  | 3.14-6      |
| 3.14-6  | Groundwater Statewide (South) .....   | 3.14-6      |
| 3.14-7  | Erodable Soils Statewide (North) .....  | 3.14-6      |
| 3.14-8  | Erodable Soils Statewide (South) .....  | 3.14-6      |
| 3.15-1  | Bay Area to Merced Habitat.....   | 3.15-8      |
| 3.15-2  | Bay Area to Merced Wetlands.....  | 3.15-20     |
| 3.15-3a | Sacramento to Bakersfield Habitat (North) .....   | 3.15-22     |
| 3.15-3b | Sacramento to Bakersfield Habitat (South) .....   | 3.15-22     |
| 3.15-4a | Sacramento to Bakersfield Wetlands (North).....   | 3.15-22     |
| 3.15-4b | Sacramento to Bakersfield Wetlands (South) .....  | 3.15-22     |
| 3.15-5  | Bakersfield to Los Angeles Habitat .....  | 3.15-24     |
| 3.15-6  | Bakersfield to Los Angeles Wetlands .....   | 3.15-24     |
| 3.15-7  | Los Angeles to San Diego (Inland) Habitat .....   | 3.15-26     |
| 3.15-8  | Los Angeles to San Diego (Inland) Wetlands.....   | 3.15-26     |
| 3.15-9  | Los Angeles to San Diego Habitat .....  | 3.15-30     |
| 3.15-10 | Los Angeles to San Diego Wetlands .....   | 3.15-30     |
| 3.16-1  | Bay Area Alignment Options and Major Section 4(f) and 6(f) Resources .....                    | 3.16-4      |
| 3.16-2  | Bakersfield to Los Angeles Alignment Options and Major Section 4(f) and 6(f) Resources .....  | 3.16-4      |
| 4.2-1   | Typical Highway Improvement Cross-Sections .....  | on page 4-2 |

|        |   |              |
|--------|---|--------------|
| 4.3-1  | Maximum Operating Speeds for Express Service on Proposed HST System Northern California ..... | 4-6          |
| 4.3-2  | Maximum Operating Speeds for Express Service on Proposed HST System Southern California.....  | 4-6          |
| 5.2-1  | Regions and Counties .....  | on page 5-4  |
| 5.3-1  | Methodology Overview .....  | on page 5-8  |
| 5.3-2  | County-Level Population Growth under No Project Alternative .....                             | on page 5-16 |
| 5.3-3  | County-Level Population Growth under Modal Alternative .....                                  | on page 5-16 |
| 5.3-4  | County-Level Population Growth under HST Alternative .....                                    | on page 5-18 |
| 5.3-5  | County-Level Employment Growth under No Project Alternative .....                             | on page 5-18 |
| 5.3-6  | County-Level Employment Growth under Modal Alternative.....                                   | on page 5-20 |
| 5.3-7  | County-Level Employment Growth under HST Alternative .....                                    | on page 5-20 |
| 6.2-1  | San Francisco to San Jose Alignment and Potential Station Options .....                       | 6-4          |
| 6.2-2  | Oakland to San Jose Alignment and Potential Station Options .....                             | 6-6          |
| 6.2-3  | San Jose to Merced Alignment Options.....   | 6-10         |
| 6.3-1  | Sacramento to Stockton Alignment and Potential Station Options .....                          | 6-22         |
| 6.3-2a | Stockton to Merced Alignment and Potential Station Options.....                               | 6-26         |
| 6.3-2b | Potential Merced Station Options .....  | 6-26         |
| 6.3-3a | Merced to Fresno Alignment and Potential Station Options.....                                 | 6-30         |
| 6.3-3b | Potential Fresno Station Options.....   | 6-30         |
| 6.3-4a | Fresno to Bakersfield Alignment and Potential Station Options .....                           | 6-32         |
| 6.3-4b | Potential Bakersfield Station Options.....  | 6-32         |
| 6.3-5a | Potential Sacramento Station Options .....  | 6-40         |
| 6.3-5b | Potential Stockton Station Options .....  | 6-40         |
| 6.4-1  | Bakersfield to Sylmar Alignment and Potential Station Options .....                           | 6-48         |
| 6.4-2  | Sylmar to Los Angeles Alignment and Potential Station Options.....                            | 6-54         |
| 6.5-1  | Los Angeles to March ARB Alignment and Potential Station Options .....                        | 6-60         |
| 6.5-2  | March ARB to Mira Mesa Alignment and Potential Station Options .....                          | 6-66         |
| 6.5-3  | Mira Mesa to San Diego Alignment and Potential Station Options.....                           | 6-70         |
| 6.6-1  | Los Angeles to LAX Alignment and Potential Station Options .....                              | 6-80         |
| 6.6-2  | Los Angeles to Anaheim/Irvine Alignment and Potential Station Options.....                    | 6-82         |
| 6.6-3a | Irvine to Oceanside Alignment and Potential Station Options.....                              | 6-88         |
| 6.6-3b | San Juan Capistrano and San Clemente Alignment Options.....                                   | 6-88         |
| 6.6-4a | Oceanside to San Diego Alignment and Potential Station Options .....                          | 6-92         |
| 6.6-4b | Del Mar Alignment Options.....  | 6-92         |

**TABLES**

|        | <b>On Page</b>   |        |
|--------|--|--------|
| S.5-1  | Estimated Total Travel Times (Door to Door) between City Pairs by Auto, Air, and HST in 2020 (Hours:Minutes) .....   | S-8    |
| S.6-1  | Summary of Key Environmental Impacts and Benefits for System Alternatives.....   | S-9    |
| 1.2-1  | Intercity Air Travel Between Southern California and San Francisco Bay Area (Annual Enplanements) .....  | 1-6    |
| 1.2-2  | Travel Growth in 20 Years for Intercity Highways.....  | 1-7    |
| 1.2-3  | Estimated Travel Time Between City Pairs By Auto, Air, and Rail in 2000 and 2020 .....   | 1-8    |
| 2.4-1  | Existing California Intercity Highway System.....  | 2-12   |
| 2.4-2  | Total Programmed, Funded, and Operational Airport Improvements .....   | 2-13   |
| 2.4-3  | Programmed, Funded, and Operational Improvements Adjusted for Trips Inside California.....   | 2-14   |
| 2.5-1  | Definition of Highway Improvements .....   | 2-19   |
| 2.5-2  | Definition of Aviation Improvements .....  | 2-21   |
| 2.6-1  | Express Travel Times.....  | 2-24   |
| 2.6-2  | HST Performance Criteria.....  | 2-26   |
| 2.6-3  | Review of Previous Studies of High-Speed Train Alternatives: Corridor Options Considered but Eliminated .....  | 2-30   |
| 2.6-4  | Service Comparison Example: Sacramento to Bay Area (Altamont vs. Pacheco) .....  | 2-37   |
| 2.6-5  | High-Speed Rail Alignment and Station Evaluation Objectives and Criteria.....  | 2-42   |
| 2.6-6  | Bay Area to Merced: High-Speed Train Alternative Alignment and Station Options Considered and Eliminated.....  | 2-45   |
| 2.6-7  | Sacramento to Bakersfield High-Speed Train Alternative Alignment and Station Options Considered and Eliminated.....  | 2-56   |
| 2.6-8  | Bakersfield to Los Angeles: High-Speed Train Alternative Alignment and Station Options Considered and Eliminated.....                                      | 2-68   |
| 2.6-9  | Los Angeles to San Diego via Inland Empire High-Speed Train Alternative Alignment and Station Options Considered and Eliminated .....                      | 2-75   |
| 2.6-10 | Los Angeles to San Diego via Orange County High-Speed Train Alternative Alignment and Station Options Considered and Eliminated.....                       | 2-83   |
| 2.7-1  | Improvement Definition for Highways .....  | 2-97   |
| 3.1-1  | Level of Service and Volume-to-Capacity Ratio Definition.....  | 3.1-2  |
| 3.1-2  | Summary of Existing and No Project Conditions .....  | 3.1-7  |
| 3.1-3  | Summary of Locations Degrading by Two or More Levels of Service under Existing and No Project Alternative Conditions Sacramento to Bakersfield Region..... | 3.1-9  |
| 3.1-4  | Summary of No Project Conditions Compared to Modal and HST Alternatives .....  | 3.1-12 |
| 3.1-5  | Segments Operating at LOS F (V/C Higher than 1.0) Bay Area to Merced .....   | 3.1-14 |
| 3.1-6  | Segments Operating at LOS F (V/C higher than 1.0) Sacramento to Bakersfield .....  | 3.1-16 |
| 3.1-7  | Segments Operating at LOS F (V/C higher than 1.0) Bakersfield to Los Angeles.....  | 3.1-18 |
| 3.1-8  | Segments Operating at LOS F (V/C higher than 1.0) Los Angeles to San Diego via Inland Empire .....   | 3.1-20 |

|        |   |        |
|--------|---|--------|
| 3.1-9  | Segments Operating at LOS F (V/C higher than 1.0) Los Angeles to San Diego via Orange County (LOSSAN) .....                           | 3.1-21 |
| 3.2-1  | Relation of Travel Factors and Purpose and Need/Objectives .....  | 3.2-3  |
| 3.2-2  | Transportation Factors.....   | 3.2-4  |
| 3.2-3  | California Airport National Rankings (2002) .....   | 3.2-5  |
| 3.2-4  | Existing Conditions Compared to No Project Alternative .....  | 3.2-8  |
| 3.2-5  | Total Door-to-Door Automobile Travel Times (Hours:Minutes).....   | 3.2-9  |
| 3.2-6  | Total Door-to-Door Air Travel Time (Hours:Minutes).....   | 3.2-10 |
| 3.2-7  | Total Door-to-Door High-Speed Train Mode Travel Times (Hours:Minutes) .....   | 3.2-12 |
| 3.2-8  | Modal Reliability .....   | 3.2-14 |
| 3.2-9  | Reliability Statistics for Air Travel in California.....  | 3.2-17 |
| 3.2-10 | Safety Performance by Mode.....   | 3.2-23 |
| 3.2-11 | Safety Performance by Alternatives.....   | 3.2-24 |
| 3.2-12 | 1997 Intercity Trip Table Summary .....   | 3.2-25 |
| 3.2-13 | 2020 Intercity Trip Table Summary Business Plan Scenario (Low End) .....  | 3.2-26 |
| 3.2-14 | 2020 Intercity Trip Table Summary Sensitivity Analysis Scenario (High End).....   | 3.2-27 |
| 3.2-15 | Daily 1997 Average Air Frequencies by Airport Pair (Each Direction) .....   | 3.2-29 |
| 3.2-16 | 2020 High-Speed Train Frequencies by Station Pair (Each Direction).....   | 3.2-30 |
| 3.2-17 | Auto Ownership and Operating Costs by Category (2003\$)* .....  | 3.2-36 |
| 3.2-18 | One-Way Door-to-Door Trip Automobile Costs (2003\$).....  | 3.2-36 |
| 3.2-19 | Average One-Way Door-to-Door Air Trip Passenger Costs (2003\$) .....  | 3.2-37 |
| 3.2-20 | High-Speed Train One-Way Door-to-Door Trip Passenger Costs (2003\$) .....   | 3.2-38 |
| 3.3-1  | State and National Ambient Air Quality Standards .....  | 3.3-3  |
| 3.3-2  | Pollutant Burden Rates Requiring a Conformity Determination.....  | 3.3-7  |
| 3.3-3  | Attainment Status of Affected Air Basins.....   | 3.3-11 |
| 3.3-4  | On-Road Mobile Source Regional Analysis—No Project and Modal Alternatives.....  | 3.3-17 |
| 3.3-5  | Airplane Pollutant Burdens—No Project and Modal Alternatives .....  | 3.3-18 |
| 3.3-6  | On-Road Mobile Source Regional Emissions Analysis—No Project Alternative and HST Sensitivity Analysis Alternative.....                | 3.3-21 |
| 3.3-7  | Airplane Emission Burdens—No Project Alternative and HST Sensitivity Analysis Alternative.....  | 3.3-22 |
| 3.3-8  | Electrical Power Station Emissions—No Project Alternative and HST Sensitivity Analysis Alternative .....                              | 3.3-23 |
| 3.3-9  | Potential Impacts on Air Quality Statewide—Existing, No Project, Modal, and HST Sensitivity Analysis Alternatives .....               | 3.3-24 |
| 3.3-10 | On-Road Mobile Source Emission Regional Analysis—No Project Alternative and HST Investment-Grade Ridership Forecast Alternative ..... | 3.3-28 |
| 3.3-11 | Airplane Emission Burdens—No Project Alternative and HST Investment-Grade Ridership Forecast Alternative .....                        | 3.3-29 |
| 3.3-12 | Electrical Power—No Project Alternative and HST Investment-Grade Ridership Forecast Alternative.....                                  | 3.3-30 |
| 3.3-13 | Potential Impacts on Air Quality Statewide—Existing, No Project, Modal, and HST Investment-Grade Ridership Alternatives.....          | 3.3-31 |
| 3.4-1  | Summary of Noise Impact Ratings for Alternatives .....  | 3.4-16 |

|        |  |         |
|--------|--|---------|
| 3.4-2  | Potential Length and Cost of Noise Mitigation by Alternative .....   | 3.4-25  |
| 3.5-2  | Construction-Related Energy Consumption Factors.....   | 3.5-5   |
| 3.5-3  | Annual Intercity Operational Energy Consumption in the Study Area.....   | 3.5-13  |
| 3.5-4  | Annual Intercity Operational Energy Consumption in Study Area .....  | 3.5-15  |
| 3.5-5  | Energy Consumption Based on Passenger Miles Traveled (PMT) .....   | 3.5-16  |
| 3.5-6  | Non-Recoverable Construction-Related Energy Consumption.....   | 3.5-19  |
| 3.5-7  | Annual Intercity Operational Energy Consumption in Study Area (Assuming Investment-Grade Ridership Forecasts)..... | 3.5-21  |
| 3.7-1  | Compatibility of Land Use Types.....   | 3.7-3   |
| 3.7-2  | Rankings of Potential Property Impacts .....   | 3.7-4   |
| 3.8-1  | Impacts on Potential System-wide Agricultural Land by Alternative.....   | 3.8-10  |
| 3.8-2  | Potential Farmland Impacts: Express Loops Compared to Mainlines .....  | 3.8-14  |
| 3.9-1  | Potential Visual Impacts by Region .....   | 3.9-12  |
| 3.10-1 | Rankings for Potential Public Utilities Impacts/Conflicts.....   | 3.10-3  |
| 3.10-2 | Summary of Potential Public Utilities Conflicts for Alternatives .....   | 3.10-6  |
| 3.11-1 | Potential Hazardous Material and Waste Sites Comparison Modal and High-Speed Train Alternatives.....               | 3.11-5  |
| 3.12-1 | Summary Rating Table—Potential Impacts on Cultural and Paleontological Resources .....                             | 3.12-18 |
| 3.12-1 | Summary Rating Table – Potential Impacts on Cultural and Paleontological Resources .....                           | 3.12-18 |
| 3.13-1 | Ranking System for Comparing Impacts Related to Geology/Soils/Seismicity .....                                     | 3.13-2  |
| 3.13-2 | Summary of Geology Potential Impact Rankings by Alternative and Segment .....                                      | 3.13-9  |
| 3.14-1 | Summary of Potential Hydrologic Resource and Water Quality Impacts for Alternatives .....                          | 3.14-10 |
| 3.15-1 | Summary of Impacts on Biological Resources for Modal and HST Alternatives .....                                    | 3.15-19 |
| 3.16-1 | Rankings for Potential Direct and Proximity Impacts on Section 4(f) and d(f) Resources) .....                      | 3.16-2  |
| 3.16-2 | Number of Potential High Impacts on Section 4(f) and 6(f) Resources by Region and Alternative .....                | 3.16-6  |
| 4.2-1  | Total Cost for Modal Alternative.....  | 4-1     |
| 4.3-1  | Optimal Express Trip Times between City Pairs (220 mph [350 kph] maximum speed) .....                              | 4-5     |
| 4.3-2  | Annual Costs of Operating and Maintaining HST Infrastructure.....  | 4-7     |
| 4.3-3  | Annual Costs of Operating and Maintaining an HST System .....  | 4-7     |
| 4.3-4  | Annual Operating Costs (Millions of 2003 Dollars) .....  | 4-8     |
| 5.2-1  | Year 2002 Population, Employment, and Urbanized Densities.....   | 5-2     |
| 5.3-1  | Projected Population Growth Rate by Region .....   | 5-9     |
| 5.3-2  | Projected Employment Growth Rate by Region .....   | 5-10    |
| 5.3-3  | Increase in Urbanized Area Size by Region .....  | 5-11    |
| 5.3-4  | Percent of Incremental Growth by Industry .....  | 5-11    |
| 5.3-5  | Year 2035 Employment and Population County and Regional Totals.....  | 5-15    |
| 5.3-6  | Year 2035 Size of Urbanized Area by Alternative County and Regional Totals .....                                   | 5-20    |
| 5.3-7  | Potential Land Consumption Efficiencies .....  | 5-22    |

|       |   |      |
|-------|---|------|
| 5.4-1 | Farmland Resources Potentially Affected by Future Urbanization .....            | 5-28 |
| 5.4-2 | Hydrology and Water Resources Potentially Affected by Future Urbanization ..... | 5-31 |
| 5.4-3 | Biological Resources Potentially Affected by Future Urbanization .....          | 5-32 |
| 5.4-4 | Wetlands Potentially Affected by Future Urbanization .....                      | 5-33 |
| 7.3-1 | Summary of Key Environmental Impact/Benefits of Alternatives .....              | 7-6  |